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(51) INT CL<sup>5</sup>  
**G06K 11/08**

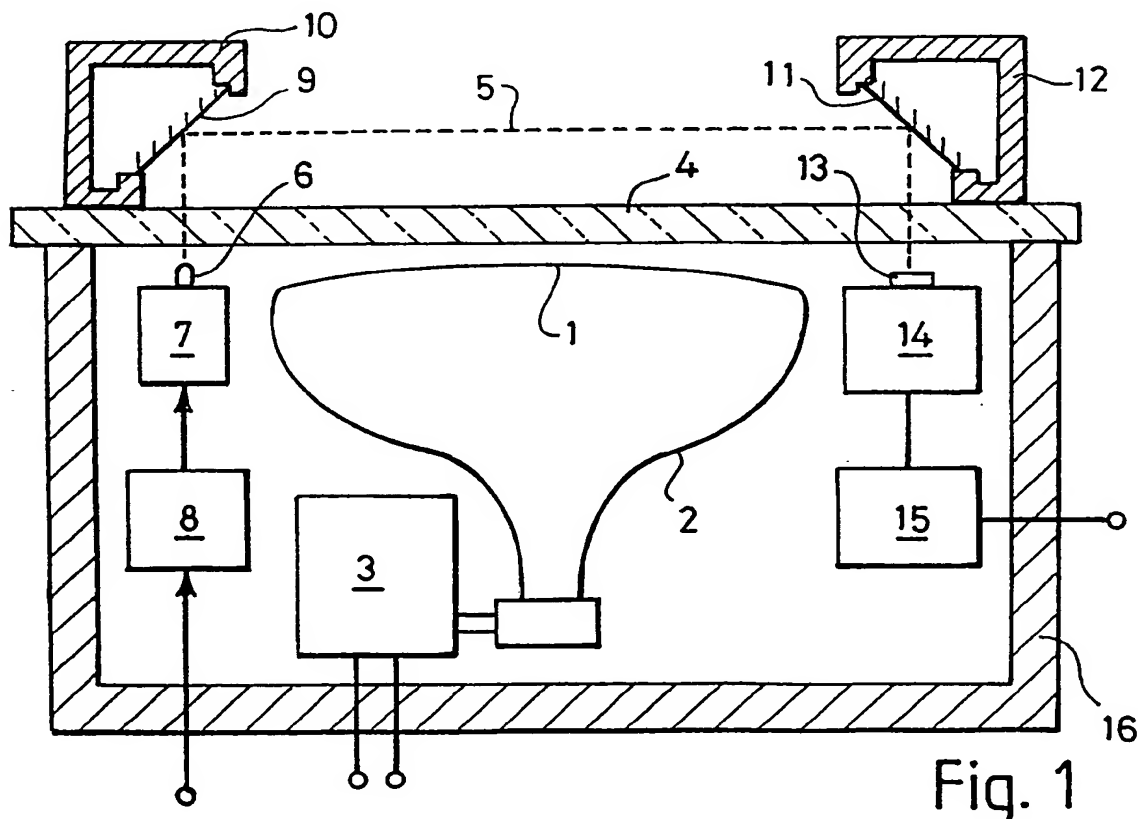
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**G1A AA3 AD10 AEN AG1 AG17 AG4 AG7 AG9**  
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**U1S S2284 S2313**

(56) Documents cited  
**GB 2180061 A GB 2082427 A US 4880969 A**

(58) Field of search  
**UK CL (Edition K) G1A AEN**  
**INT CL<sup>5</sup> G06K 11/06 11/08**

## (54) Touch screen systems

(57) A touch screen system includes a display screen 1 behind a window 4, beam transmitters 7, beam detectors 14, and reflective surfaces 9, 11 mounted in front of the window. A matrix of beams 5 passes from the transmitters 7, through the window 4, and are reflected across the face of the window, back through the window, and detected by the detectors 14. The beams intersect in a matrix array in front of the window, and breaking of the beams at any point of intersection is detected.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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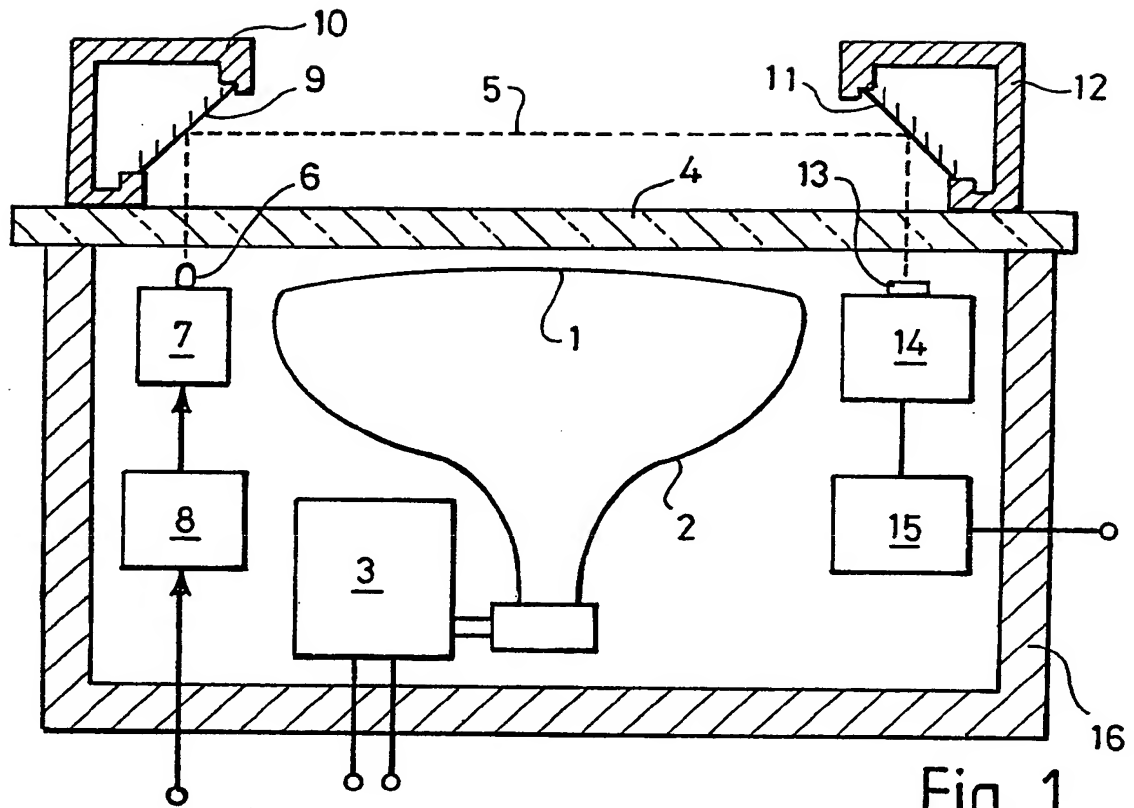


Fig. 1

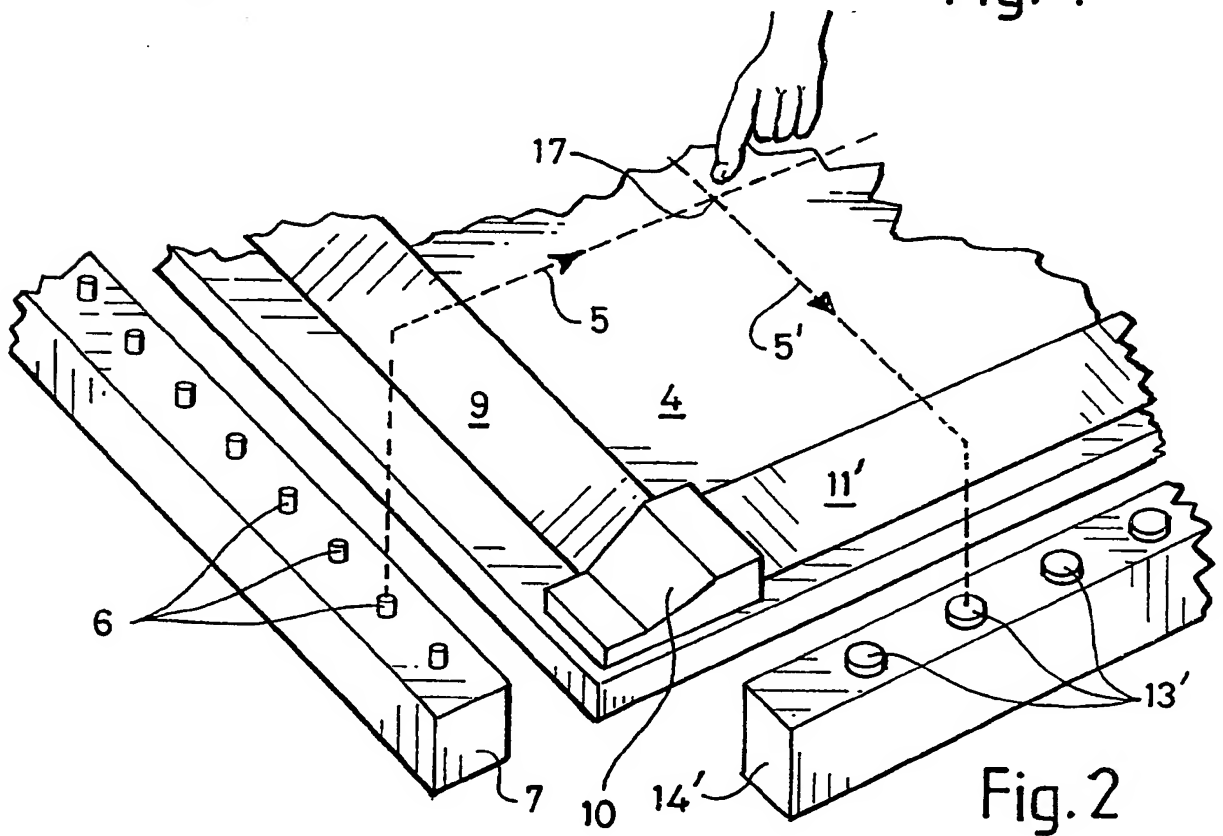


Fig. 2

Title: Improvements in or relating to Touch Screen Systems

Field of the Invention:

5 The invention relates to touch screen systems. Particularly  
systems which are located in explosive or hazardous  
environments. However, the invention is also applicable to  
touch screen systems in which it is desirable to isolate the  
person interacting with the systems from the electronics of  
10 the system.

Background to the Invention

Touch screen systems are known in which a matrix of optical  
15 beams are arranged to traverse the face of a television or  
computer screen so that when two of the beams are  
interrupted this occurrence is sensed and the interrupted x  
and y coordinates which are interrupted identify a unique  
location on the screen. The unique location is associated  
20 with information or options which may be selected by  
pointing a finger at the relevant unique location.

Generally, a bank of infra-red or light emitting diodes  
(LED) direct a series of parallel beams across the face of  
25 the screen so that the signals are detected by a bank of  
light-signal receivers which are monitored to detect when  
the beam from the corresponding LED is interrupted.

The LED and light receivers are in "line-of-sight" in front  
30 of the screen.

It will be appreciated that if the touch screen system is  
located in an explosive or hazardous environment the  
electronics of the LED and light receivers is in front of  
35 the screen and, under fault conditions, this can cause an

explosion or fire.

Such an arrangement also provides the opportunity for the electronics of the system to be interfered with by a user.

- 5 The present invention seeks to provide a touch screen system which isolates the electronics of the system from the user and the local environment.

#### Summary of the Invention

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- According to a first aspect of the invention there is provided a touch screen system including a screen upon which information is arranged to be displayed at preset locations, which are arranged to be uniquely identified by a matrix of  
15 beams. Said beam being reflected across the face of a transparent window in front of the screen and reflected onto receivers located behind the window.

- According to a second aspect of the invention there is  
20 provided a touch screen system including a screen upon which information is arranged to be displayed at preset locations, which are arranged to be uniquely identified by a matrix of beams emanating from a number of beam transmitters located behind a transparent window which isolates the touch screen  
25 system from the environment, and a number of beam receivers each arranged to receive one of the beams and to provide an output to a detector circuit which identifies when the beam has been interrupted, characterised in that the beam from each of the light transmitters is directed onto a  
30 reflecting surface which redirects the beam across the face of the screen to impinge on a second reflective surface arranged to redirect the beam onto a corresponding one of the beam receivers.

### Summary of the Drawings

The invention will now be described, by way of example, with  
5 reference to the accompanying diagrammatic drawing in  
which:-

Figure 1 shows a schematic view of a touch screen system;  
and,

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Figure 2 shows a perspective cut away view of part of the  
system.

### Specific Description

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Referring now to the drawings, figure 1 shows a screen 1 of  
a cathode ray tube 2 which is arranged to display  
information in a known manner from a driver circuit and  
associated electronics 3. The screen 1 is located  
20 immediately adjacent a transparent window 4. A matrix of  
beams 5 is arranged to traverse the face of the window 4.  
The beams are emitted by a set of light emitting diodes  
(LED) 6 mounted on a unit 7 and powered from a control  
circuit 8. The beams from the LED 6 are directed through  
25 the window 4 to a mirror 9 held in a mounting 10 at 45° to  
the window 4. The beam is reflected from the mirror 9  
across the face of the screen 1 to impinge on a mirror 11  
mounted at 45° in a mounting 12. The beam is reflected from  
the mirror 11 onto a corresponding one of beam receiving  
30 detectors 13 mounted in a unit 14 which is coupled to a  
detecting circuit 15. The entire electronics of the touch  
screen system is sealed by a casing 16 onto the window 4.

It will be appreciated that the system is shown  
35 schematically and that there is a further set of LED and

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receivers to provide the orthogonal grid or matrix of beams necessary to uniquely distinguish the positions adjacent to relevant information on the screen. The similar set of transmitters, receivers and mirrors have been given the same reference numerals but with a superscript to indicate the y coordinate.

Referring now to figure 2 it will be seen that the beams 5 and 5' intersect at a point 17. When the beams are interrupted by a finger the light paths are prevented from reaching the receivers 13 and 13' and this uniquely identified point 17 and the relevant screen information associated with this point.

It will be appreciated that the system may be used in a shop or banking premises as it permits the isolation of the customer from the electronic circuitry of the touch screen system by the interposition of the window 4. The system also has a particular application in hazardous and explosive environment as it permits the complete electronics to be incased by the casing 16 and window 4 so that any hot or sparking components within the system are isolated from the hazardous environment.

Care should be taken in positioning the mirrors so that the beam can be maintained as a narrow beam accurately reflected by the mirrors onto the receivers. The mirrors may be incorporated within a frame mounted on a window and the frame may be substantially the size of the screen 1. If necessary the light emitting diodes need not be located directly below the mirror but offset so that the beams emerge obliquely from the window 4. In such cases the angle of the mirror will not be 45° but adjusted so that the beam is parallel to the surface of the window and just above it.

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In certain applications it may be advantageous to stagger the set of LEDs and beam receivers so that two or more grid patterns are created at differentiating heights above the window 4. Such an arrangement may be used to confirm the  
5 unique location and to prevent false signals which may occur by flies or other material falling on the window.

It will be appreciated that the principle of isolating the user from the touch screen system may be adapted for many  
10 applications which permit mirrors to be located on the user side of the window so that the user may be isolated from the electronics of the touch screen according to the principle of the invention.

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CLAIMS

- 1 A touch screen system which includes a screen upon  
which information is to be displayed at preset locations,  
5 which locations are arranged to be uniquely identified by a  
matrix of beams, said beams being reflected across the face  
of a transparent window in front of the screen and reflected  
onto receivers located behind the window.
- 10 2 A system according to claim 1 wherein the matrix of  
beams emanates from a plurality of beam transmitters located  
behind a transparent window which isolates the touch screen  
from its environment, and the beam receivers are each  
15 arranged to receive one of the beams to provide an output to  
a detector circuit which identifies where the beam has been  
interrupted, characterised in that the beam from each of the  
beam transmitters is directed onto a reflecting surface  
which redirects the beam across the face of the screen to  
20 impinge on a second reflective surface arranged to redirect  
the beam onto a corresponding one of the beam receivers.
- 3 A system according to claims 1 or 2 wherein the beam  
transmitters are light emitting diodes.
- 25 4 A system according to claims 1 or 2 wherein the beam  
transmitters are infra-red emitting diodes.
- 5 A system according to any of the preceeding claims  
wherein the reflecting surfaces are mounted at an angle of  
30 45 degrees to the front surface of the window.
- 6 A system according to any of the preceeding claims  
wherein the beams are parallel with the front surface of the  
window on passing from the first reflective surface to the  
35 second reflective surface.



7 A system according to any of the preceeding claims  
wherein the beams intersect orthogonally.

8 A system according to any of the preceeding claims  
5 wherein the electronic circuitry and cathode ray tube are  
isolated from the environment by a casing.

9 A system according to any of the preceeding claims  
wherein the beam detector circuit is operatively connected  
10 to the cathode ray tube.

10 A touch screen substantially as herein described with  
reference to the accompanying drawings.

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**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

GB 9201824.1

**Relevant Technical fields**

- (i) UK CI (Edition K ) G1A (AEN)
- (ii) Int CI (Edition 5 ) G06K 11/06 11/08

Search Examiner

R S CLARK

**Databases (see over)**

(i) UK Patent Office

(ii)

Date of Search

3.9.92

Documents considered relevant following a search in respect of claims

1

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2180061 A	(ALPS ELECTRIC) whole document	Claims 1-7, 9
X	GB 2082427 A	(HEWLETT-PACKARD) whole document	Claims 1-9
X	US 4880969 A	(LAWRIE) line 39 column 4 to line 31 column 5	Claims 1-6, 8 and 9

SF2(p)

HCS - doc99\fil000248

Category	Identity of document and relevant passages	Relevant to claim(s)

### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family, corresponding document.

**Databases:** The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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